CLAIMS:

1. A device for holding a liquid solution and allowing the reaction thereof with immobilized biological material as a part of an assay, which device comprises:

a plate in which there are formed a group of wells which extend completely therethrough, wherein the walls of said wells are substantially liquid impervious,

a microporous material closing the bottom of each said well, and

at least one spot of a polymer attached to the upper surface of said microporous bottom of each of a plurality of said wells, which spot comprises a crosslinked hydrogel polymer having biological material so immobilized on or within the polymer as to be contactable by a liquid supplied to said well.

2. The device of claim 1 wherein said wells contain polymer spots that cover only a portion of the bottom surface of each well, leaving a substantial portion through which drainage can be effected.

3. The device of claim 2 wherein said polymer spots are generally centrally located on said bottom surface.

4. The device of claim 1 wherein said group of wells is arranged to form a regular array.

5. The device of claim 4 wherein at least some of said plurality of wells contain different biological materials.

6. The device of claim 1 wherein the polymer is formed from an isocyanate-functional prepolymer, which prepolymer comprises polyethylene glycol or polypropylene glycol.

7. The device of claim 1 wherein said microporous material is hydrophobic and said microporosity is such that an aqueous solution supplied to said well remains therein until the application of a vacuum to the undersurface of said microporous material.

8. The device of claim 7 wherein said microporous material has an average pore size not greater than about 1 μm.

9. The device of claim 1 wherein said biological material comprises DNA, RNA, protein or living cells.

10. The device of claim 1 wherein the plate is formed of polycarbonate, polystyrene, polypropylene, polytetrafluoroethylene, polyethylene or a combination thereof and has a uniform thickness not greater than about 2 mm.

11. The device of claim 10 wherein said microporous material comprises a polymeric membrane formed of polypropylene, polytetrafluoroethylene or polyethersulfone having an average pore size of about 1 μm or less.

12. The device of claim 1 wherein said microporous material is fused to the undersurface of said plate to render such material impermeable throughout except for those regions aligned with said wells.

13. A method for carrying out a biological assay using the device of claim 1, which method comprises the steps of:

a) introducing a test solution into wells of a device according to claim 1,

b) after allowing opportunity for hybridization and/or binding to occur, applying a vacuum to the device to remove said solution from said wells,

c) applying an optically active reagent to each said well, and

d) optically detecting the assay results from each said well.

14. The method of claim 13 wherein an aqueous test solution is supplied to each of said wells and allowed to remain therein for a sufficient period for hybridization or binding to take place and wherein in each of said wells is then washed to remove unbound test solution.

15. A method of making a device for holding immobilized biological material and exposing said immobilized biological material with a test solution as a part of an assay, which method comprises:

providing a plate in which there are formed a group of holes which extend completely therethrough, which holes are arranged in a regular pattern,

associating a hydrophobic microporous membrane with the undersurface of said plate so as to close the bottom of each of said holes and thereby create a plurality of microwells,

attaching said membrane to the undersurface of said plate in regions that surround the perimeter about each of said holes in a manner so as to create a barrier against diffusion of a liquid solution, to be supplied to said wells, through said membrane and

applying at least one microdroplet of prepolymer hydrogel material to the upper surface of the membrane in each of at least a plurality of said wells in a manner so as to polymerize and cover only a minor portion of the surface area of said well bottom, whereby drainage of an aqueous solution through said hydrophobic membrane at the bottom of each said well can be effected by the application of vacuum to the undersurface of said membrane.

16. The method of claim 15 wherein biological material is associated with said polymerizing microdroplet so as to become immobilized as a part thereof.

17. The method of claim 16 wherein said spots are located generally centrally of the bottom surface of each well.

18. The method of claim 15 wherein said attaching is carried out by fusing a polymeric membrane to said plate by ultrasonically welding said membrane to the undersurface of said plate in regions surrounding each of said holes .

19. The method according to claim 15 wherein said spots which are applied cover less than 50% of the surface area of the bottom of each well and comprise a mixture of an isocyanate-functional hydrogel and a biological material linked thereto in a manner so as to be exposed to a liquid solution supplied to said wall.

20. A method for carrying out a biological assay, which method comprises the steps of:

a) introducing a test solution into a plurality of wells of a device in the form of a plate having a group of wells wherein a microporous material closes the bottom of each said well, and wherein at least one spot of a polymer is attached to the upper surface of said microporous bottom of each of said plurality of said wells, which spot comprises a crosslinked hydrogel polymer having biological material so immobilized on or within the polymer,

b) after allowing opportunity for hybridization and/or binding to occur, applying a vacuum to the device to remove said solution from said wells,

c) applying an optically active reagent to each said well, and

d) optically detecting the assay results from each said well.